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FOSSIL TURTLES FROM THE NEOGENE STRATA IN THE SINDA BASIN, EASTERN ZAIRE

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ABSTRACT Fossil turtles collected from the Sinda Beds of eastern Zaire contain three families. They are *Erymnochelys* sp. of family Pelomedusidae, gen. et sp. indet. of family Carettochelyidae, and gen. et sp. indet. of family Trionychidae. Among them is the first known occurrence from Africa of carettochelyid, the pig-nosed turtle, *Erymnochelys*, the big-headed side necked turtle, which once flourished in African during Tertiary, is restricted to Madagascar, today. All of these are presumed to have had aquatic habitat in rivers and lakes.

RESUME Les fossiles des tortues collectées des couches de Sinda à l'est du Zaïre contiennent trois familles. Il y a *Erymnochelys* sp. de la famille Pelomedusidae (pseudémyde à grosse tête), une espèce non identifiée de la famille de Carettochelyidae (carettochélyde; tortue à nez de porc), et famille Trionychidae (trionychidé; tortues à carapace lisse). Parmi eux, carettochelyid est le premier connu de l'Afrique. Malgré que *Erymnochelys* a été florissant en Afrique durant le tertiaire, il est aujourd'hui limité au Madagascar. Toutes ces tortues sont présumées avoir un habitat aquatique dans les rivières et les lacs.

Key Words: Turtles; Neogene; Sinda; Carottochelyidae; Osteology; Paleoecology.

INTRODUCTION

Turtle remains are abundant in Miocene to Pleistocene deposits of East Africa (Auffenberg, 1981; Broin, 1979; Meylan & Auffenberg, 1986; Meylan et al., 1990; Wood, 1971). Fossil turtles are considered to be potentially useful for reconstruction of paleoenvironments, because these chelonian taxa are easily comparable with the living counterparts in general. Meylan (1990) first reported on the systematics of turtle materials from the Pliocene Upper Semliki, Zaire, among the fauna of the Western Rift. Recently, the Japan-Zaire cooperative expeditions in eastern Zaire have revealed a potentially rich vertebrate fauna from the Sinda Beds (latest Miocene to early Pliocene; Yasui et al., in this volume). I describe the chelonian specimens from the Sinda Beds and discuss the paleoenvironmental and paleobiogeographical issues.

SYSTEMATICS

I follow Gaffney and Meylan (1988) for the hierarchy of turtle systematics.

Class Reptilia
Order Testudines
Gigaorder Casichelydia
Megaorder Pleurodira

Diagnosis: Pelvic girdle sutured to the shell. Posterior neurals reduced, with posterior pleurals usually meeting together.

Family Pelomedusidae

Diagnosis: Cervical scute absent. Third to eighth cervical centra procoelous.

Genus *Erymnochelys* Baur, 1888

Diagnosis: Intergular very small, not completely subdividing gulars medially.
Erymnochelys sp.

Materials:

SN-419 (site 3); Fig. 1; Plate 1; shell associated with the pelvic girdle (350 mm long as preserved)

SN-605 (site 11); Fig. 2; Plate 2; shell (466 mm long, as preserved)

SN-230 (site 15); Plate 3; posterior cervical vertebra (centrum 24 mm long)

SN-225 (site 15); right first pleural

SN-357 (site 7); neural plate (31 mm wide and 13 mm thick)

Description: SN-419 and 605 are the best preserved turtle materials from the Sinda Beds. SN-419 appears to be considerably crushed. The pelvic girdle, which is articulated with shell and partially broken, is visible. Many sutures and scute sulci on carapace are obscured by numerous cracks caused by postmortem distortion as shown in Fig. 1. Nonetheless, it is apparent that the cervical scute is absent so that the first marginals

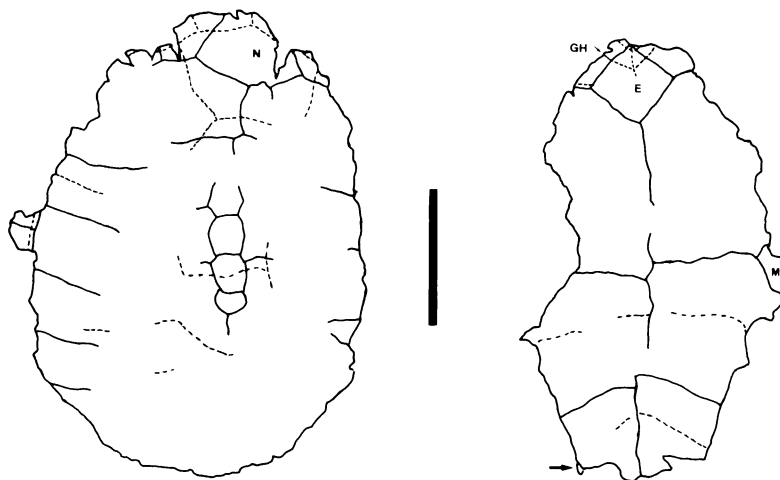


Fig. 1. SN-419, *Erymnochelys* sp. Carapace in dorsal view and plastron in ventral view, with solid sutures and scute sulci dashed as preserved. Note the post-mortem distortion on the carapace. Scale bar 10 cm. E: entoplastron; GH: gulo-humeral sulcus; M: mesoplastron; N: nuchal. Arrow points to the portion of pelvic girdle sutured to shell.

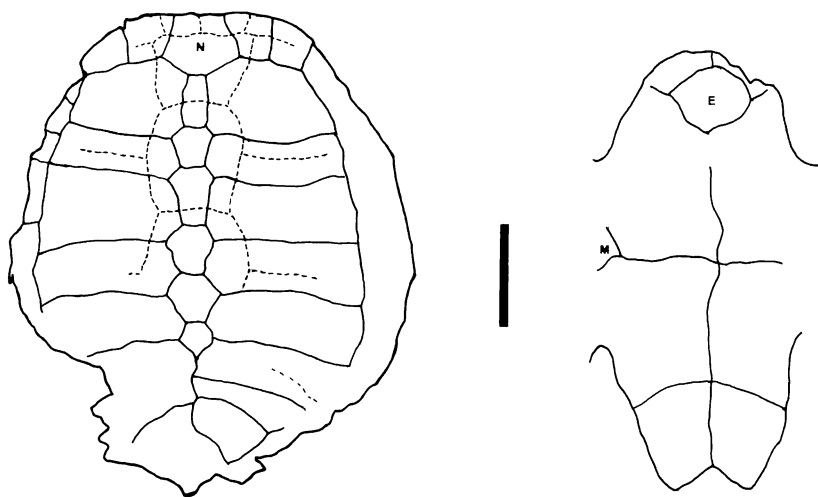


Fig. 2. SN-605, *Erymnochelys* sp. Carapace in dorsal view and plastron in ventral view, drawn from photograph and sketch presented by Kunimatsu, with solid sutures and scute sulci dashed. Scale bar 10 cm. E: entoplastron; M: mesoplastron; N: nuchal.

medially meet. The first vertebral scute is anteriorly broad, reaching the first peripherals. The six neural plates are recognizable, and the posterior pleurals seem to meet medially. The neural surface is smooth, and no vertebral keel is recognizable. The preservation of sutures and scute sulci on the plastron is better than that on the carapace. The intergulars appear small, barely reaching the entoplastron. Thus, the gular scutes medially merge on the entoplastron. Although the humero-pectoral sulcus is poorly preserved, this seems to intersect with the entoplastron. The bridge region of the plastron is largely broken away, but the left mesoplastron is partially preserved laterally to the hyo-hypoplastra. The hyo-hypoplastra are tightly sutured together, not showing a movable hinge.

SN-419 is considered to be a pleurodire based on the sutured articulation of the pelvic girdle with shell. Furthermore, the loss of the cervical scute is a synapomorphy shared by pelomedusids, except for *Peltocephalus*, and *Elseya* of the family Chelidae, another member of the pleurodires not yet known from Africa. The retention of the mesoplastron, which is lost from the family Chelidae, is a primitive character of the pelomedusids. The pelomedusids are abundant in Africa since early Cretaceous. Some dozen species of fossil pelomedusids have been described from this continent. Most of specimens are shells, and some taxa such as *Scweboemys*, *Stereogenys* and extant *Pelusios* and *Pelomedusa* have a clearly unique character in shell morphology. However, the remaining fossil pelomedusids described as genus *Podocnemis* have a rather uniform and possibly primitive shell.

Recently, Gaffney (1988) proposed a generic relationship among the pelomedusids, including the well known fossil genera. He recognized five extant genera, *Podocnemis*, *Peltocephalus*, *Erymnochelys*, *Pelusios*, and *Pelomedusa* in Pelomedusidae. Among

them, the former two genera are living on South America. *Pelusios* and *Pelomedusa* are known from both Africa and Madagascar. *Erymnochelys* is restricted to Madagascar. *Erymnochelys madagascariensis* is the only living pelomedusid with gular scutes medially meeting together. Thus, SN-419 could be identified as this genus. Nonetheless, the fossil pelomedusids with such a short intergular have been classified as genus *Podocnemis* or even other genera from the African Tertiary. The early Oligocene *P. fajumensis* (Andrews, 1903), early Miocene *P. aegyptiaca* (Andrews, 1900), and Pliocene *Kenyemys williamsi* (Wood, 1983) are such pelomeusids. These African "*Podocnemis*" species are known from only the shell materials showing definite gulars which are similar to extant *Erymnochelys*. Thus, from the cladistic point of view, the generic identification of SN-419 should be *Erymnochelys*. The specific revision among fossil *Erymnochelys* is beyond the purpose of this paper, so that SN-419 shall be classified as *Erymnochelys* sp., here.

SN-605 is a better preserved shell. Unfortunately, I have not examined this interesting specimen directly. According to the photographe, drawing, and measurements presented by Kunimatsu (a member of the Joint Japan-Zaire Expedition to eastern Zaire), general morphology, particularly that of carapace, is identical to SN-419. The cervical scute is absent, and the first marginal scutes meet medially. Six neural plates are observed, and the sixth to eighth pleurals meet medially. Although it is difficult to trace any scute sulci on the plastron from the photographe, the shape of each plastral element is similar to that of SN-419. Therefore, I regard this material to be of the same taxon, *Erymnochelys* sp., as SN-419.

SN-230, which comes from an individual of about 40 cm long shell, is a well preserved cervical vertebra showing a procoelous centrum in the pleurodiran manner. As Williams (1950) stated, the third to eighth cervical centra of the pelomedusids are procoelous, and among them, South American *Podocnemis* and *Peltocephalus* show a definite saddle-shaped articulation. SN-230 shows no such peculiar pattern as extant African pelomedusids including *Erymnochelys*. Comparison with the cervical vertebrae of *Pelusios* and *Pelomedusa* of my private collection makes clear that SN-230 has a more pronounced ventral keel on the centrum. I provisionally assign this specimen to *Erymnochelys*, here.

The shell fragments, SN-225 and 357, are thick and concordant with large sized pleomedusids like *Erymnochelys*. SN-225 has a strong axillary plastral buttress which is not seen in *Pelusios* and *Pelomedusa*.

Pelomedusidae gen. et sp. indet.

Material:

SN-161 (site 5); left femur (51 mm in length, as preserved; proximal portion absent)

Description: This is a femur of an individual with a shell about 25 cm long. The ventral keel indicates a pleurodiran character, but further identification is not possible.

Megaorder	Cryptodira
Superfamily	Trionychoidea
Family	Carettochelyidae
Subfamily	Carettochelyinae

Diagnosis: All of the scutes are absent from the adult. Size is large, with its carapacial length reaching 50 cm.

Gen. et sp. indet.

Material:

SN-074 (site 3); Plate 4; right 10th peripheral plate

Description: This is the most interesting specimen among the turtles from the Sinda Beds. External surface is covered with rugose granulations, reminding us of the sculpturing of trionychids. This sculpturing is more pronounced on the dorsal surface. The sculpturing on the surface is well preserved, while any scute sulci can not be observed. Both anterior and posterior margins of this specimen are articulate sutures with adjacent plates. The lateral margin is irregularly wedged. Any sutured structure cannot be observed at the medial margin. A pit, apparently a facet for the distal portion of the thoracic rib, remains at the medial margin. This pit is angled toward the posterior, suggesting a posterior element among peripherals. The length along the lateral border is 66 mm, suggesting an individual with a carapace approximately 50 cm long.

As pointed out by Meylan (1987), the peripherals never sutured to pleurals are the unique character shared only by carettochelyids and trionychids among turtles. In trionychids, however, the only living Indian *Lissemys* shows peripherals, though these elements are small and irregularly circular in shape, restricted on the posterior margin of the carapace, not connecting with any thoracic rib, in this genus. Thus, the present specimen, SN-074, should be classified as a carettochelyid. Meylan (1988) summarized the generic relationships among the family Carettochelyidae. Though the present specimen is fragmented, and many characters Meylan used were based on the skull, at least one shell character, namely the loss of all scute sulci in adult, including marginals, seems to be useful for this material in cladistic diagnosis. Among carettochelyids, two fossil genera, *Allaeochelys* and *Chorlakkichelys*, and living *Carettochelys* share this character, and they are classified as sub-family Carettochelyinae (Meylan, 1988). Therefore, I identify this specimen as posterior, possibly the 10th peripheral plate of carettochelyines, although no member of this family has ever been reported from Africa. Its relatively large size supports the carettochelyine identification.

Family Trionychidae

Gen. et sp. indet.

Materials:

SN-018 (site 1); Plate 5-3; pleural

SN-093 (site 15); Plate 5-1; neural plate

SN-011 (site 3); Plate 5-4; pleural

SN-006 (site 1); Plate 5-2; two pleurals

Description: The above specimens are considered to represent trionychid turtles due to the presence of punctate sculpture. Further identification is not possible.

DISCUSSION

The turtle fauna from the Sinda Beds is different from those of today's African elements in the following aspects. (1) First discovery of a carettochelyid from Africa. (2) The occurrence of *Erymnochelys* species, which is restricted to Madagascar, today. (3) Lack of *Pelusios* and *Pelomedusa*, which are abundant living African pelomedusids. (4) Lack of any testudinid (family Testudinidae) land tortoise, which is a major element of African turtles since the late Eocene.

The first discovery of carettochelyid from Africa is most significant. Since its first appearance in the early Cretaceous, carettochelyids flourished in the Northern Hemisphere, including Eurasia (early Cretaceous to late Eocene), India (Eocene) and North America (Eocene). After Eocene, however, the fossil record of this family is known from only the late Miocene of New Guinea (Glaessner, 1942), and the sole relic group, *Carettochelys* lives in New Guinea and Northern Australia, today. Although the present material is so fragmentary that its generic identification is uncertain, this first discovery of carettochelyid from Africa demonstrates our scant knowledge about turtle history on this continent.

The disappearance of *Erymnochelys* from Africa after the Pliocene might relate to some kind of climatic change since the late Pliocene. *Pelusios* and *Pelomedusa* seem to endure drier environments much more readily than other pelomedusids (Ernst & Barbour, 1989). Because fossil *Pelusios* is known from the early Miocene of Kenya (Williams, 1954), the absence of this genus might indicate a much more humid condition of the Western Rift than today. Occurrence of *Erymnochelys*, trionychids and carettochelyid, all of which are considered to prefer a very aquatic habitat, and the lack of terrestrial testudinid are concordant with this assumption

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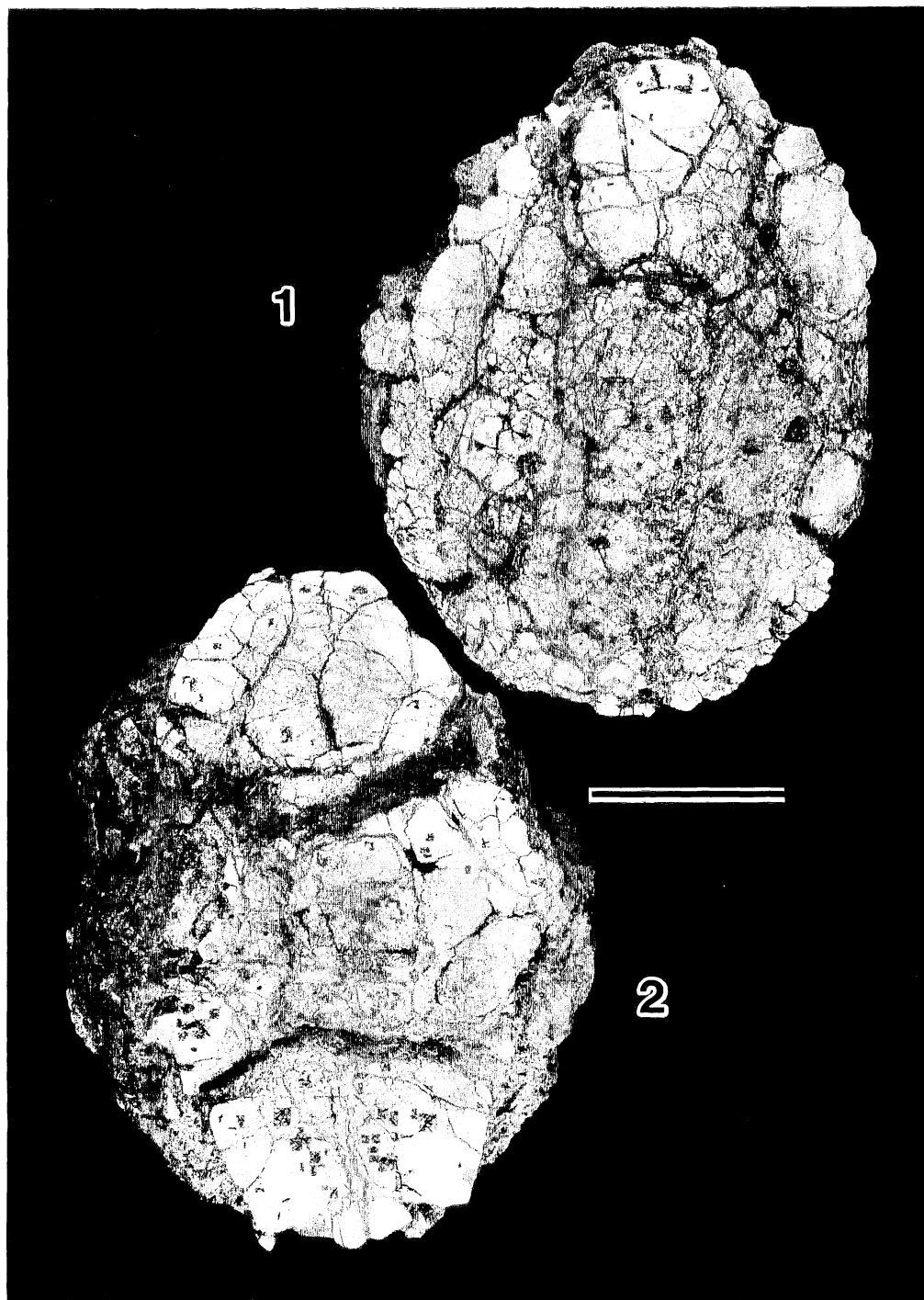
Explanation of Plate 1

SN-419, *Erymnochelys* sp., shell. Scale bar 10 cm.

1: Dorsal view of carapace.

2: Ventral view of plastron.

Plate 1



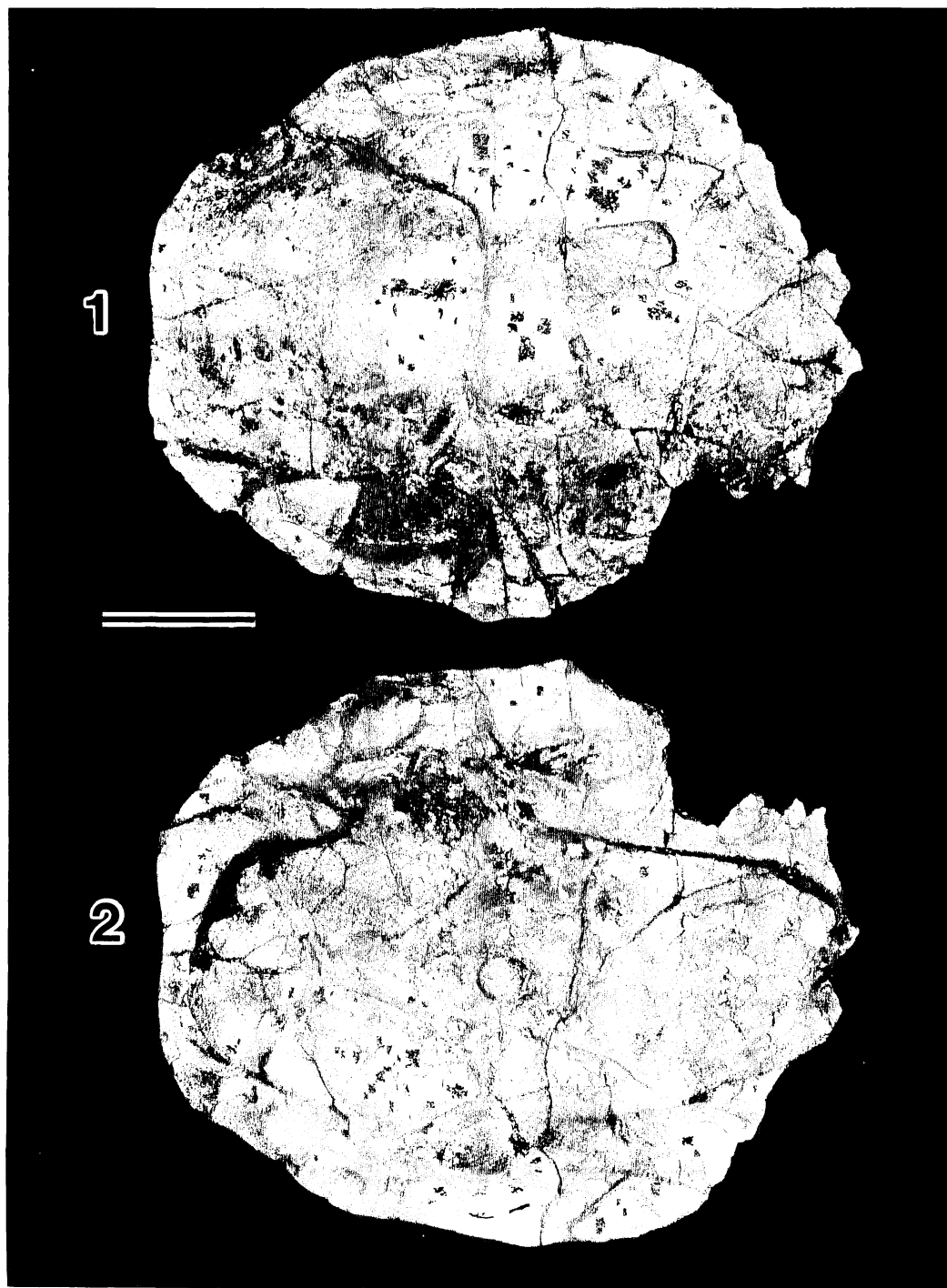
Explanation of Plate 2

SN-605, *Erymnochelys* sp., shell. Scale bar 10 cm.

1. Dorsal view of carapace.

2. Ventral view of plastron.

Plate 2



Explanation of Plate 3

SN-230, *Erymnochelys* sp., posterior cervical vertebra. Scale bar 1 cm.

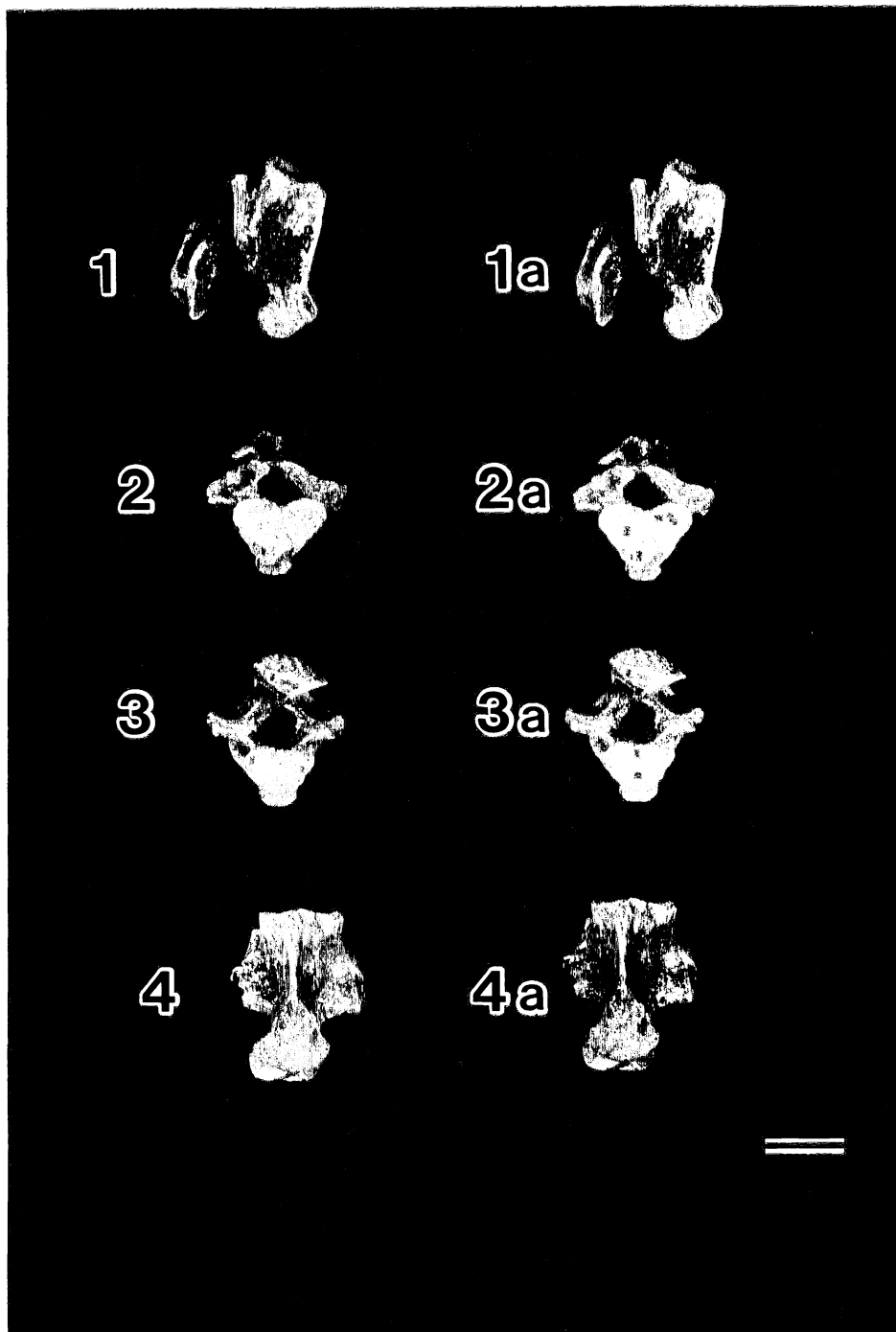
1, 1a: Right lateral view.

2, 2a: Anterior view.

3, 3a: Posterior view.

4, 4a: Ventral view.

Plate 3



Explanation of Plate 4

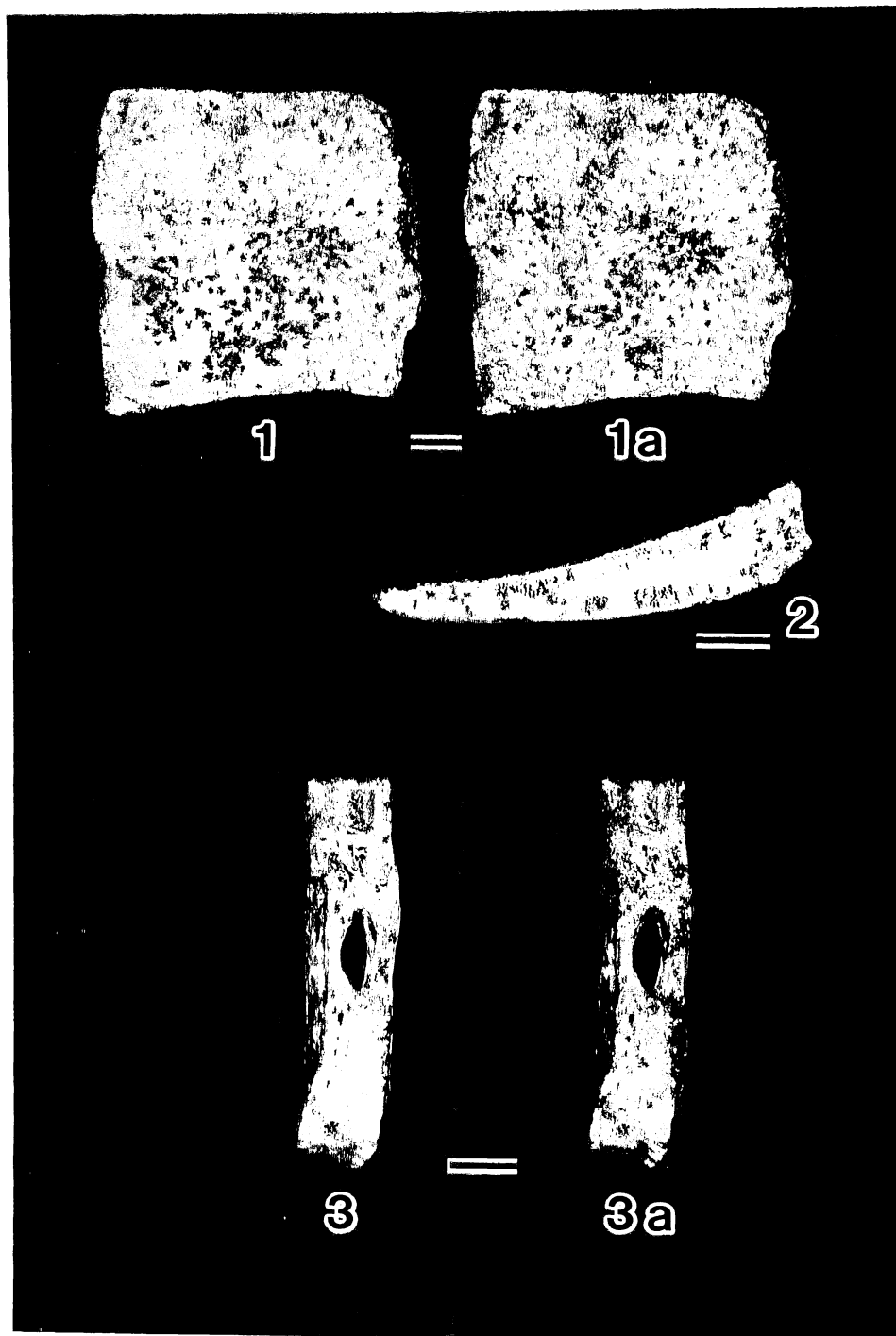
SN-074, Carettochelyinae, gen. et sp. indet., right 10th peripheral plate. Scale bar 1 cm.

1, 1a: Dorsal view.

2: Anterior view.

3, 3a: Medial view.

Plate 4



Explanation of Plate 5

Carapacial fragments of Trionychidae, gen. et sp. indet. All dorsal views. Each scale bar 1 cm.

1: SN-093, neural plate.

2: SN-006, two pleural plates.

3: SN-018, pleural plate.

4: SN-011, pleural plate.

Plate 5

